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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/633,071	08/01/2003	Thomas J. McIntyre	BA-00590 (1763-13-3)	6330
996	7590	11/28/2005	EXAMINER	
GRAYBEAL, JACKSON, HALEY LLP			LEPISTO, RYAN A	
155 - 108TH AVENUE NE			ART UNIT	
SUITE 350			PAPER NUMBER	
BELLEVUE, WA 98004-5901			2883	

DATE MAILED: 11/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/633,071

Applicant(s)

MCLNTYRE ET AL.

Examiner

Ryan Lepisto

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 October 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 10-14 is/are allowed.
- 6) ☒ Claim(s) 1-4, 9 and 15-24 is/are rejected.
- 7) ☒ Claim(s) 5-8 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

1. **Claims 15-24** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The newly amended independent claims 15, 18 and 22 add the limitation that the second optical transmission layer has an angle relative to the lower optical transmission layer that is defined by the angle of the angled sidewall and wherein the angle has a value between five degrees and a maximum angle having a value defined by the indices of the refraction of the second optical transmission layer and the first cladding layer and wherein light having the same mode as light propagating through the lower optical transmission layer propagates through the second optical transmission layer.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. **Claims 1 and 9** are rejected under 35 U.S.C. 102(b) as being anticipated by **Thomas (US 5,198,008)**. Thomas teaches a method of optically interconnecting layers in an integrated circuit (Figs. 1A-F and 3) comprising forming a first optical core layer (20) over a substrate (10) having a first substrate layer (12) and an additional support layer (16) (Figs. 1A-B, column 3 lines 11-65), forming a first cladding layer (24) on the first core layer (20) (Fig. 1D, column 4 lines 3-9), removing portions of the first cladding layer (24) to form a 90 degree angled via (26) exposing the first core layer (Fig. 1D, column 4 lines 9-11) and forming a second optical core layer (28) on the angled via (26) and first core layer (22) (Fig. 1E, column 4 lines 17-23).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. **Claim 2** is rejected under 35 U.S.C. 103(a) as being unpatentable over Thomas as applied to claim 1 and 9 above, and further in view of **Lee et al (US 2004/0017962 A1)** (Lee).

Thomas teaches the interconnect described above

Thomas does not teach expressly using silicon oxynitride as the core layer.

Lee teaches an optical interconnect using silicon oxynitride as the core layer (paragraph 0047).

Thomas and Lee are analogous art because they are from the same field of endeavor, optical coupling in planar structures.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use silicon oxynitride as the core layer as taught by Lee in the structure taught by Thomas since Thomas teaches a core made of glass (silicon) material.

The motivation for doing so would have been to increase coupling efficiency by choosing materials with high refractive index difference (Lee, paragraph 0047) that insures that light is not leaked into the core.

4. **Claim 3** is rejected under 35 U.S.C. 103(a) as being unpatentable over Thomas as applied to claims 1 and 9 above, and further in view of **Congdon et al (US 5,673,284)** (Congdon).

Thomas teaches the interconnect described above

Thomas does not teach expressly using silicon dioxide as the cladding layer.

Congdon teaches an optical interconnect using silicon dioxide as the cladding layer (column 5 lines 5-16).

Thomas and Congdon are analogous art because they are from the same field of endeavor, optical coupling in planar structures.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use silicon dioxide as the cladding layer as taught by Congdon in the

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structure taught by Thomas since Thomas teaches a cladding made of a glass material or any other material with sufficient strength to support a glass core (column 3 lines 29-35).

The motivation for doing so would have been to increase coupling efficiency by choosing materials with high refractive index difference that insures that light is not leaked into the core and to ensure mechanical integrity by using materials with needed strength.

5. **Claim 4** is rejected under 35 U.S.C. 103(a) as being unpatentable over Thomas as applied to claims 1 and 9 above, and further in view of what would have been obvious to one of ordinary skill in the art at the time of applicant's invention.

Thomas teaches the interconnect described above.

Thomas does not teach expressly and 50 degree angled sidewall.

At the time the invention was made, it would obvious to a person of ordinary skill in the art to have an angle sidewall as any useable angle. Applicant has not disclosed that exactly 50 degrees or less provides an advantage, is used for a particular purpose, or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Applicant's invention to perform equally well with the interconnect taught by Thomas since light is coupled between the two core layers.

The motivation would have been to increase coupling efficiency by maximizing coupling properties (light angle, materials, wavelength, etc) for maximum coupling efficiency.

Allowable Subject Matter

6. **Claims 5-8** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: With regard to claims 5-8: These claims would be allowable over the prior art of record if rewritten in independent form including all of the limitations of the base claim and any intervening claims because the latter, either alone or in combination, does not disclose nor render obvious a method of optically interconnecting layers in an optical integrated circuit including a substrate by forming a first optical transmission layer over the substrate, forming a first cladding layer on the first optical transmission layer, removing portions of the first cladding layer to form an angled sidewall in the first cladding layer by forming mesa structures at desired locations and removing the mesa structures and portions of the cladding and forming an optical interconnect layer on the angled sidewall of the first cladding layer and on an exposed portion of the first optical transmission layer or forming a second cladding on the first interconnect layer and forming a sidewall in the same fashion, in combination with the rest of the claimed limitations.

7. **Claims 10-14** are allowed.

With regard to claim 10: This claim is allowable over the prior art of record because the latter, either alone or in combination, does not disclose nor render obvious

a method of optically interconnecting layers in an optical integrated circuit including a substrate by forming a first optical transmission layer over the substrate, forming a first cladding layer on the first optical transmission layer, removing portions of the first cladding layer to form an angled sidewall in the first cladding layer and forming an optical interconnect layer on the angled sidewall of the first cladding layer and on an exposed portion of the first optical transmission layer or by removing portions of the first transmission layer and forming a first dielectric layer in the void, removing portions of the first dielectric layer to planarize upper surfaces of the layer in the void regions and forming a first cladding layer on the planarized surface, forming mesa structures on the first cladding, removing the mesa structure to form the angled sidewall and forming a second optical transmission layer on the angled sidewall, in combination with the rest of the claimed limitations.

With regard to claims 11-14: These claims are allowable over the prior art of record because they depend on allowable claims 1 and 10.

8. **Claims 15-24** would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, 1st paragraph, set forth in this Office action.

The following is a statement of reasons for the indication of allowable subject matter: With regard to claims 15, 18 and 22: These claims are allowable over the prior art of record because the latter, either alone or in combination, does not disclose nor render obvious an optical integrated circuit formed on a substrate having a lower transmission layer formed over the substrate, a first cladding layer having an angled

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sidewall formed on the lower transmission layer with an angle relative to the lower transmission layer, a second transmission formed over the lower transmission layer and angled wall wherein the second transmission layer has an angle relative to the lower transmission layer that is defined by the angle of the angled sidewall and wherein the angle has a value between five degrees and a maximum angle having a value defined by indices of refraction of the second transmission layer and the first cladding with light having a same mode of light propagates through the lower and second transmission layers through total internal reflection, in combination with the rest of the claimed limitations.

Response to Arguments

9. Applicant's arguments with respect to the rejections have been considered but are moot in view of the new ground(s) of rejection due to amended claims.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ryan Lepisto whose telephone number is (571) 272-1946. The examiner can normally be reached on M-F 7:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank Font can be reached on (571) 272-2415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Ryan Lepisto

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Date: 11/22/05



Frank Font

Supervisory Patent Examiner

Technology Center 2800